Bidsme – multimodal dataset bidsifier

Software demonstration

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Introduction

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Bidsme

CRC GitLab, *GitHub*

- Follows BIDS *v1.2.0*
- Allow deviations from BIDS
- MRI (DICOM, Nifti), PET (DICOM, Nifti, ECAT), EEG (BrainVision)
- Extendable
  Data formats and modalities easy to add
- Supports plugins

Source dataset

GitHub:datalad/example-dicom-structural

- minimal subset from [10.1038/sdata.2014.3 (2014)]
- anonymized, one subject, structural T1-weigted scan
- Modified: for half of dcm files
  - **Series Number** changed to *402*
  - **Series Description** and **Protocol Name** changed to *anat-T2w*

Step 1: Dataset preparation

bidsme prepare dicoms/ prepared/ --no-subject --no-session

- **bidsme** – main programm, alias for *python3 bidsme.py*
- **prepare** – command, what the programm will do
- **dicoms/** – source folder, where original dicoms are found
- **prepared/** – destination folder for prepared dataset
- **--no-subject** – dicoms are not stored in folder per-subject
- **--no-session** – dicoms are not stored in folder per-session

Result:

```
~/tests/bidsme/prepared                    File: sub-02
 ../                              4 K
 code/                            4 K      sub-02/
 sub-02/                          4 K      `-- ses-/
 participants.json              124 B          `-- MRI/
 participants.tsv                22 B              |-- 401-anat-T1w/
                                                   |   |-- N2D_0001.dcm
                                                   |   |-- N2D_0002.dcm
```

Step 2: Convert to Nifti

dcm2niix -b n -f N2D_0001 prepared/sub-02/ses-/MRI/401-anat-T1w/N2D_0001.dcm

- *dcm2niix* – converter
- **-b n** – do not export meta to json
- **-f N2D_0001** – conserve the name of file

rm prepared/sub-02/ses-/MRI/*/*.dcm

- Remove converted dcm files

Result:

```
prepared/sub-02/ses-/MRI/401-anat-T1w/header_dump_N2D_0001.json
prepared/sub-02/ses-/MRI/401-anat-T1w/N2D_0001.nii
```

Step 3a: Create map
(Once per dataset)

bidsme map prepared bids

- **prepared** – prepared dataset
- **bids** – place for bidsified dataset

Result: bids/code/bidsme/*.yaml

bidsmap.yaml

```
__bids__: 1.2.0
MRI: {}
PET: {}
EEG: {}
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
```

unknown.yaml

```
__bids__: 1.2.0
MRI:
  bidsmeNIFTI:
    __unknown__:
      - provenance: prepared/sub-02/ses-/MRI/4
01-anat-T1w/N2D_0001.nii
        checked: false
        suffix: ''
        attributes: {}
        bids: !!omap []
        json: !!omap []
      - provenance: prepared/sub-02/ses-/MRI/4
02-anat-T2w/N2D_0194.nii
        checked: false
        suffix: ''
        attributes: {}
        bids: !!omap []
        json: !!omap []
```

Step 3b: Edit attributes
(Once per dataset)

bids/code/bidsme/bidsmap.yaml

bidsmap.yaml

```
__bids__: 1.2.0
MRI:
  bidsmeNIFTI:
    anat:
      - provenance: prepared/sub-02/ses-/MRI/401-anat-T1w/N2D_0001.nii
        checked: false
        suffix: 'T1w'
        attributes:
          ProtocolName: anat-T1w
        bids: !!omap []
        json: !!omap []
      - provenance: prepared/sub-02/ses-/MRI/402-anat-T2w/N2D_0194.nii
        checked: false
        suffix: 'T1w'
        attributes:
          ProtocolName: anat-T2w
        bids: !!omap []
        json: !!omap []
```

header_dump_N2D_0001.json

```
    "ManufacturerModelName": "nifti2dicom",
    "PatientName": "Jane_Doe",
    "PatientID": "02",
    "PatientBirthDate": "1966-01-01",
    "PatientSex": "F",
    "OtherPatientIDs": "",
    "PatientAge": 42,
    "PatientWeight": 75.0,
    "PregnancyStatus": 4,
    "SliceThickness": 0.666666686534882,
    "SpacingBetweenSlices": 0.666666686534882,
    "SoftwareVersions": "0.4.11",
    "ProtocolName": "anat-T1w",
    "StudyInstanceUID": "1.2.826.0.1.3680043.2
.1143.259209261169891697811311215541516 5916",
    "SeriesInstanceUID": "1.2.826.0.1.3680043.
2.1143.515404396022363061013111326823367652",
    "StudyID": "433724515",
    "SeriesNumber": 401,
    "AcquisitionNumber": 1,
```

Step 3b: Edit bids entities
(Once per dataset)

bidsme map prepared bids

bidsmap.yaml

```yaml
MRI:
  bidsmeNIFTI:
    anat:
      - provenance: prepared/sub-02/ses-/MRI/401-anat-T1w/N2D_0001.nii
        example: anat/sub-02_T1w
        checked: false
        suffix: 'T1w'
        attributes:
          ProtocolName: anat-T1w
        bids: !!omap
          - acq: <AcquisitionNumber>
          - ce: ~
          - rec: ~
          - run: <InstanceNumber>
          - mod: ~
        json: !!omap
          - ContrastBolusIngredient: ~
          - DeviceSerialNumber: '12345'
          - StationName: 'abcde'
          - MagneticFieldStrength: '7'
```

header_dump_N2D_0001.json


```
    "PatientAge": 42,
    "PatientWeight": 75.0,
    "PregnancyStatus": 4,
    "SliceThickness": 0.666666686534882,
    "SpacingBetweenSlices": 0.666666686534882,
    "SoftwareVersions": "0.4.11",
    "ProtocolName": "anat-T1w",
    "StudyInstanceUID": "1.2.826.0.1.3680043.2.1143.259209261169891697811311215541516 5916",
    "SeriesInstanceUID": "1.2.826.0.1.3680043.2.1143.515404396022363061013111326823367652",
    "StudyID": "433724515",
    "SeriesNumber": 401,
    "AcquisitionNumber": 1,
    "InstanceNumber": 1,
    "PatientOrientation": [
      "L",
      "R"
    ],
    "ImagePositionPatient": [
      -91.4495864331908,
```

Step 3b: Check entries
(Once per dataset)

bidsme map prepared bids

bidsmap.yaml

```yaml
__bids__: 1.2.0
MRI:
  bidsmeNIFTI:
    anat:
      - provenance: prepared/sub-02/ses-/MRI/401-anat-T1w/N2D_0001.nii
        example: anat/sub-02_acq-1_run-1_T1w
        checked: true
        suffix: 'T1w'
        attributes:
          ProtocolName: anat-T1w
        bids: !!omap
          - acq: <AcquisitionNumber>
          - ce: ~
```

- **provenance** – first matching file
- **example** – bidsified name
- **checked** – set to true if everything is ok

Step 4: bidsify

bidsme bidsify prepared/ bids/

```
bids/
|-- code/
|   `-- bidsme/
|       |-- .bidsmap.yaml.swp
|       |-- bidsify/
|       |   |-- bidsme.err
|       |   `-- bidsme.log
|       |-- bidsmap.yaml
|       `-- map/
|           |-- bidsme.err
|           `-- bidsme.log
|-- participants.json
|-- participants.tsv
`-- sub-02/
    |-- anat/
    |   |-- sub-02_acq-1_run-194_T1w.json
    |   |-- sub-02_acq-1_run-194_T1w.nii
    |   |-- sub-02_acq-1_run-1_T1w.json
    |   `-- sub-02_acq-1_run-1_T1w.nii
    |-- sub-02_scans.json
    `-- sub-02_scans.tsv
```

File: sub-02_acq-1_run-1_T1w.json


```
{
  "DeviceSerialNumber": "12345",
  "StationName": "abcde",
  "MagneticFieldStrength": "7",
  "Manufacturer": "BIOLAB",
  "ManufacturersModelName": "nifti2dicom",
  "SoftwareVersions": "0.4.11"
}
```

Usefull links

- Code:
  - GitLab:
    `https://gitlab.uliege.be/CyclotronResearchCentre/Public/bidstools/bidsme/bidsme`
  - GitHub:
    `https://github.com/CyclotronResearchCentre/bidsme`
- Example dataset:
  - GitLab:
    `https://gitlab.uliege.be/CyclotronResearchCentre/Public/bidstools/bidsme/bidsme_example`
  - GitHub:
    `https://github.com/CyclotronResearchCentre/bidsme_examples`
- Contact:
  `Nikita.Beliy@uliege.be`